Image A/2815

TRANSMITTAL OF APPEAL BRIEF

Docket No.
M4065.0132/P132-A

In re Application of: Eugene P. Marsh

Application No.	Filing Date	Examiner	Group Art Unit
09/594,171-Conf. #8887	June 15, 2000	G. C. Eckert	2815

Invention: OXIDATION RESISTANT PLATINUM FILM FOR CAPACITORS (AS AMENDED)

TO THE COMMISSIONER OF PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed: December 18, 2003 .

The fee for filing this Appeal Brief is 330.00 .

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[x] The Director is hereby authorized to charge any additional fees that may be required or credit any overpayment to Deposit Account No. 04-1073 .
This sheet is submitted in duplicate.

Dated: February 18, 2004

Mark J. Thronson
Attorney Reg. No. : 33,082
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP
2101 L Street NW
Washington, DC 20037-1526
(202) 828-2232

Docket No.: M4065.0132/P132-A
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Eugene P. Marsh

Application No.: 09/594,171 Confirmation No.: 8887

Filed: June 15, 2000 Art Unit: 2815

For: OXIDATION RESISTANT PLATINUM FILM FOR CAPACITORS (AS AMENDED) Examiner: G. C. Eckert

APPELLANT'S BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is an appeal pursuant to 35 U.S.C. § 134 and 37 CFR §§ 1.191 et seq. from the Final Rejection of claims 79-82 and 85-92 in the above-identified application mailed June 18, 2003. The fee for submitting this Brief ($330.00, 37 CFR § 1.17(c)) is attached hereto. Any deficiency in the fees associated with this Brief should be charged to our Deposit Account No. 04-1073. The Notice of Appeal was filed on December 18, 2003. Enclosed with this original are two copies of this brief.

The fees required under § 1.17(f) and any required petition for extension of time for filing this brief and fees therefor, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. § 1.192 and M.P.E.P. § 1206:

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is Micron Technology, Inc., the assignee of this application.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 12 claims pending in the application.

B. Current Status of Claims

1. Claims added: 79-92

2. Claims canceled: 1-78 and 83-84

3. Claims withdrawn from consideration but not canceled: none

4. Claims pending: 79-82 and 85-92

5. Claims allowed: none

6. Claims rejected: 79-82 and 85-92

C. Claims On Appeal

The claims on appeal are claims 79-82 and 85-92, which are reproduced in Appendix A.

IV. STATUS OF AMENDMENTS

There have been no amendments subsequent to the June 18, 2003 Final Rejection.

V. SUMMARY OF INVENTION

The claimed invention provides a capacitor having first and second electrodes, at least one of the electrodes comprising a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film. The platinum group metal film is both consistently smooth and has good step coverage.

Because of their high corrosion resistance, microelectronic devices having platinum group metal films are desired in applications where great reliability is desired and also where a corrosive atmosphere may be present. (Page 1, lines 12-14). Known

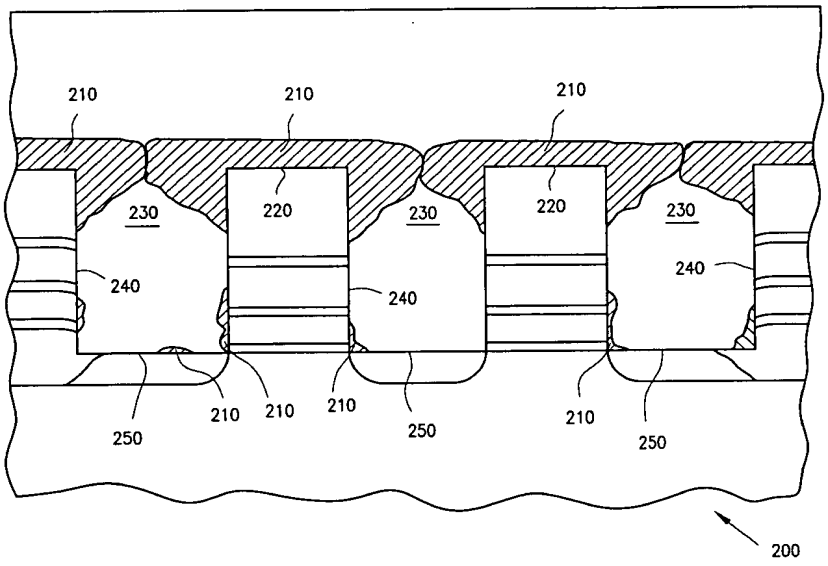
electrode deposition techniques result in platinum group metal films that are unable to achieve good step coverage, i.e., continuous films on sidewalls of three-dimensional structures. The known methods also fail to result in a platinum group metal film having a uniform thickness on sidewalls of three-dimensional structures, e.g., a trench capacitor. As explained in the present specification (page 1, lines 17-23 and page 2, line 8 through page 3, line 12), these techniques fail to achieve a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film.

The failure to achieve a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film is due to the fact that when conventional platinum group metal precursors are used in the conventional chemical vapor deposition methods, it is difficult to control the nucleation rate of the platinum group metal precursors. (Page 1, lines 24-25). At the outset of the platinum group metal precursor deposition process, the nucleation rate of the platinum group metal precursor onto the surface of the substrate is very slow; however, once nucleation begins, the deposition rate of the precursor increases significantly. (Page 1, line 25 through page 2, line 2). In fact, it is difficult to control or even slow the rate of deposition once the conventional methods begin depositing platinum group metal precursors onto the surface of the substrate. (Page 2 lines 2-5). In the conventional methods therefore, it is difficult to begin the deposition process and even more difficult to thereafter control the deposition rate so as to arrive at a uniformly thin film on the sidewalls of a three-dimensional structure, e.g., a trench capacitor. (Page 2, lines 5-7).

One example of the problem with using conventional methods to deposit platinum is discussed with reference to FIG. 1. Here it is desired to deposit a platinum layer 210 onto the side surfaces of a deep container capacitor precursor 230. The platinum layer 210 is formed by CVD deposition using a conventional platinum precursor. As the process of deposition begins, a platinum layer 210 forms on the

upper layer 220 of the capacitor precursor 230. Since it is difficult to control the deposition rate, the platinum layer 210 quickly forms a thick layer on the upper layer 220 of the capacitor precursor 230 before it can coat the inside walls of the capacitor precursor 230. That is, the quickly formed platinum layer 210 pinches together over the opening in the capacitor precursor 230 and very little platinum is able to form on the inside walls 240 or the bottom 250. Thus, an inconsistent platinum layer is formed on the inside walls 240 and the bottom 250 of the capacitor precursor 230 resulting in poor step coverage. (Page 2, lines, 8-20).

FIG. 1
(PRIOR ART)

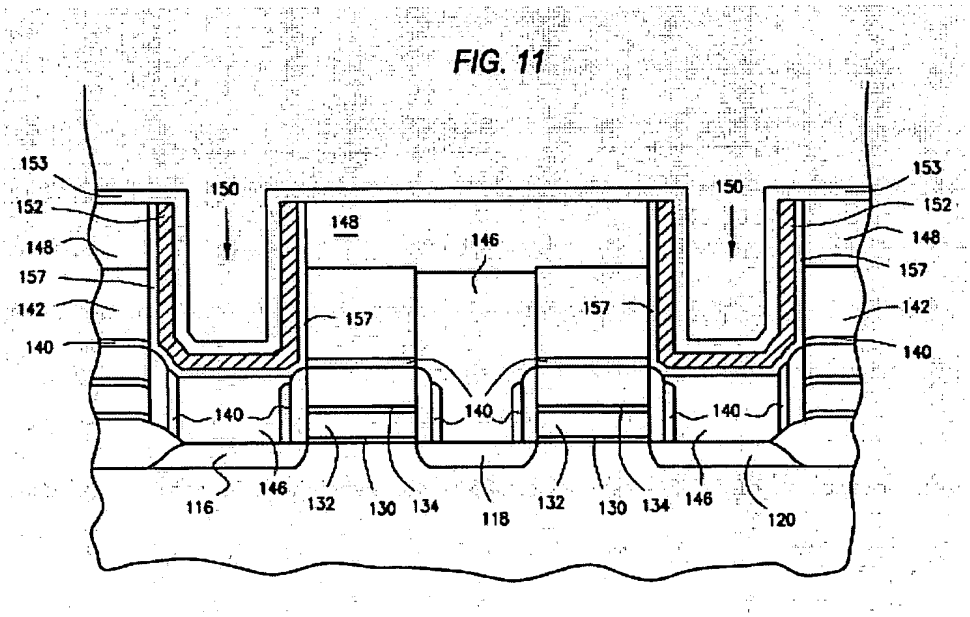


As discussed in the specification (page 2, line 26 through page 3, line 1), it has been suggested that the temperature at which the platinum group metal precursors were deposited should be decreased. Once the temperature of the CVD process is decreased, the growth rate of the platinum also decreases, resulting in better step coverage; however, an unintended consequence of decreasing the temperature is a high carbon content measured in the deposited film, resulting in poor platinum group metal film quality. (Page 3, lines 1-3).

To reduce the carbon content of the film, oxygen could be added during the CVD process. (Page 3, lines 4-5). Although the addition of oxygen removes some of the carbon from the platinum film, the oxygen also increases the deposition rate resulting in a film similar to the deposited film described above with respect to FIG. 1. (Page 3, lines 5-8). Thus, without the present invention it is difficult to achieve a uniform platinum group metal film, that is essentially carbon free, on the sidewalls of three-dimensional structures, e.g., a trench capacitor.

The present invention overcomes the drawbacks of the prior art by providing an improved platinum group metal film for a capacitor electrode (Page 3, lines 15-18). The metal film is uniform, essentially carbon-free, oxygen annealed, and photo-decomposed. The film is formed by first depositing a platinum metal group precursor in conjunction with ultraviolet light, followed by low temperature annealing in an oxygen atmosphere to remove carbon. An exemplary embodiment of the resulting structure is illustrated below in FIG. 11. As discussed in the specification (page 15, lines 20-23), a second platinum group metal film may be provided over the first platinum group metal film 152.

FIG. 11



VI. ISSUES

A. Whether the rejection of claims 79-82 and 85-92 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,090,697 (hereinafter "Xing") should be reversed?

B. Whether the rejection of claims 79-82 and 85-87, 89, and 92 under 35 U.S.C. § 103(a) as being unpatentable over Xing should be reversed?

C. Whether the rejection of claims 88, 90, and 91 under 35 U.S.C. § 103(a) as being unpatentable over Xing in view of U.S. Patent No. 5,566,045 (hereinafter "Summerfelt") should be reversed?

VII. GROUPING OF CLAIMS

For purposes of this appeal brief only, and without conceding the teachings of any prior art reference, the claims have been grouped as indicated below:

Group	Claims
I.	Claims 79, 80, and 86-92
II.	Claims 81 and 82
III	Claim 85

Claims of Group I do not stand or fall together with claims of Groups II and III. Claims of Group II do not stand or fall together with claims of Groups I and III. Group III includes only one claim, and does not stand or fall together with claims of Groups I and II. In Section VIII below, Applicant has included arguments supporting the separate patentability of each claim Group, as required by M.P.E.P. § 1206.

VIII. ARGUMENTS

A. The Anticipation Rejection of Claims 79-82 and 85-92 Should be Reversed

1. The Anticipation Rejection of Claims 79, 80, and 86-92 (Group I) Should be Reversed

Claims 79, 80, and 86-92 stand rejected under 35 U.S.C. § 102(e) as anticipated by Xing. Claim 79 recites a "capacitor comprising: a substrate having a trench; a barrier layer disposed over a surface of said trench; a first electrode in contact with said barrier layer at a sidewall region; a dielectric layer in contact with said first electrode and said barrier layer; and a second electrode in contact with said dielectric layer at a sidewall region." Claim 79 further recites that "at least one of said first and second electrodes comprises a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film."

Xing relates to a high-selectivity via etching process. Specifically, Xing teaches a process in which an etchstop layer is formed; a dielectric layer is formed over the etchstop layer, and the dielectric layer is etched with a fluorine-bearing etchant. Xing fails to teach or suggest a capacitor having at least one electrode "at a sidewall region" being "a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film." Indeed, Xing discloses a step of forming a platinum layer by conventional sputter deposition. (Col. 10, lines 30-34). Because Xing forms its platinum layer by conventional sputter deposition, the layer will not have a uniform thickness on the sidewalls of the trench capacitor illustrated (FIG. 3). Even if the platinum layer were somehow uniform, it would not be "essentially carbon-free" at the sidewall region.

The Examiner contends that FIG. 3 of Xing teaches all of the claim limitations of independent claim 79. The Examiner admits, however, that Xing makes no mention

as to the carbon content of the final device. The Examiner also argues that because carbon is detrimental to the device, it is considered inherent that the Xing electrode is essentially free of carbon. This is an untenable position. It is not supported by the evidence. As admitted by the Examiner, Xing fails to disclose the importance of maintaining an essentially carbon-free platinum layer.

As discussed above with respect to the summary of the invention, conventional platinum layers have a relatively high carbon content. The claimed invention improves on the product disclosed by Xing. As such, claim 79 recites a platinum group metal film "essentially carbon-free" at a sidewall region.

Further, the Examiner argues that the limitation "oxygen annealed photo-decomposed platinum group metal film" is drawn to the process by which the capacitor is made, and can be ignored. Please note, however, that the claims recite a capacitor structure having distinct and defined characteristics. The term "uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film" describes the physical characteristics of at least one of first and second electrodes in claim 79.

Claim limitations which confer distinct and defined characteristics of a structure were analyzed by the Federal Circuit in Hazani v. U.S. Int'l Trade Comm'n, for example, which involved patent claims to a memory cell comprising a conductive plate having a surface that was "chemically engraved." Hazani v. U.S. Int'l Trade Comm'n, 126 F.3d 1473, 44 USPQ2d 1358 (Fed. Cir. 1997). In Hazani, the Federal Circuit emphasized that the claims were "pure product claims" and not product-by-process claims. The plaintiff had argued that the "chemically engraved" claims were product-by-process claims. The Federal Circuit determined, however, that the claims were "best characterized as pure product claims, since the 'chemically engraved'

limitation, read in context, describes the product more by its structure than by the process used to obtain it." Id.

Here too, the limitation "uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film" of claim 79 is a structural limitation and not a product-by-process limitation. A "uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film," like the "chemically engraved" plate of Hazani, is a *resulting structure* having distinct and defined characteristics and not a product formed by a particular process.

Even if we were to assume that the claim limitations of claim 79 could somehow be considered product-by-process limitations, "[t]he structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product." MPEP § 2113 (citing In re Garnero, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979)).

For example, the uniform, essentially carbon free oxygen annealed photo-decomposed platinum group is deposited onto the barrier layer without oxidizing the underlying barrier layer during the annealing step. Additionally, due to the manner in which the platinum group metal is deposited, the platinum group metal film is deposited as a platinum group metal film having a uniform thickness of about 20 to about 2000 Angstroms. In the present case, the process by which the platinum group metal film is deposited results in a platinum group metal film that is essentially carbon-free.

For at least the foregoing reasons, claim 79 is allowable over Xing. Claims 80 and 86-92 depend from claim 79, and are allowable along with claim 79. Accordingly, Appellant respectfully submits that the rejection of claims 79, 80, and 86-92 under 35 U.S.C. § 102(e) should be reversed.

2. The Anticipation Rejection of Claims 81 and 82 (Group II) Should be Reversed

Claims 81 and 82 stand rejected under 35 U.S.C. § 102(e) as anticipated by Xing. Claims 81 and 82 depend from claim 79 and should be allowable for at least the reasons set forth above with respect to claims 79, 80, and 86-92. Moreover, claims 81 and 82 should be allowable on their own merits. Claim 81 recites "the capacitor according to claim 79, wherein said first electrode comprises said uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film." As discussed above with respect to claim 79, Xing fails to teach or suggest a uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less teach or suggest that the first electrode has the uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film.

Claim 82 recites "the capacitor according to claim 81, wherein said first electrode is a lower electrode." As discussed above, with respect to claim 81, Xing fails to teach or suggest a first electrode comprising said uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less teach or suggest that the first electrode is a lower electrode.

Appellant respectfully submits that the rejection of claims 81 and 82 under 35 U.S.C. § 102(e) should be reversed.

3. The Anticipation Rejection of Claim 85 (Group III) Should be Reversed

Claim 85 stands rejected under 35 U.S.C. § 102(e) as anticipated by Xing. Claim 85 depends from claim 79 and should be allowable for at least the reasons set forth above with respect to claims 79, 80, and 86-92. Moreover, claim 85 should be allowable on its own merit. Claim 85 says that "said . . . platinum group metal film is oxidation resistant." As discussed above with respect to claim 79, Xing fails to teach or suggest a uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less that the platinum group metal film is oxidation resistant. Appellant respectfully submits that the rejection of claim 85 under 35 U.S.C. § 102(e) should be reversed.

B. The Obviousness Rejection of Claims 79-82, 85-87, 89, and 92 Should be Reversed

1. The Obviousness Rejection of Claims 79, 80, 86, 87, 89, and 92 (Group I) Should be Reversed

Claims 79, 80, 86-87, 89, and 92 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Xing. Having admitted that Xing does not even mention the problem of carbon content, the Examiner contends, in the alternative, that the deposition of a platinum layer in an oxygen environment is known in the art, and that this technique would reduce the carbon content of platinum layers. The Examiner fails to recognize, however, that the process of sputter deposition, as taught by Xing, in the presence of oxygen would result in the disadvantage of having "pinch-off" effect described above with respect to FIG. 1. That is, the process disclosed by Xing would not result in a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film.

Additionally, please note that the addition of oxygen in a sputtering process would result in a platinum group metal film having a high carbon content, i.e., not a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film. Therefore, Xing fails to teach or suggest the capacitor of claim 79, which has an electrode comprising "a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film."

As the Federal Circuit has stated: "In order to render a claimed apparatus or method obvious, the prior art must enable one skilled in the art to make and use the apparatus or method." Beckman Instruments, Inc. v. LKB Produkter AB, 892 F.2d 1547, 1551, 13 USPQ2d 1301, 1304 (Fed. Cir. 1989) (citing In re Payne, 606 F.2d 303, 314, 203 USPQ 245, 255 (CCPA 1979) ("References relied upon to support a rejection under 35 USC 103 must provide an enabling disclosure, i.e., they must place the claimed invention in the possession of the public. An invention is not 'possessed' absent some known or obvious way to make it.") (quoting In re Hoeksema, 399 F.2d 209, 274 (CCPA 1968)). The Federal Circuit reiterated this proposition in Motorola, Inc. v. Interdigital Technology Corp., 121 F.3d 1461, 1472, 43 USPQ2d 1481, 1489 (Fed. Cir. 1997) (quoting Beckman, supra).

Where the reference does not include an enabling disclosure, "secondary evidence, such as other patents or publications, can be cited to show public possession of the method of making and/or using [the claimed article]." M.P.E.P. § 2121.01(I). Here, there is no such enabling disclosure as the Final Rejection fails to cite any secondary evidence that a method of making and/or using the claimed capacitor with its electrode comprising a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film" was in the public possession at the time of the present invention.

For at least the foregoing reasons, claim 79 is allowable over Xing. Claims 80, 86, 87, 89, and 92 depend from claim 79, and are allowable along with claim 79. Accordingly, Appellant respectfully submits that the rejection of claims 79, 80, 86, 87, 89, and 92 under 35 U.S.C. § 103(a) should be reversed.

2. The Obviousness Rejection of Claims 81 and 82 (Group II) Should be Reversed

Claims 81 and 82 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Xing. Claims 81 and 82 depend from claim 79 and is allowable for at least the reasons set forth above with respect to claims 79, 80, and 86-92. Moreover, claims 81 and 82 are allowable on their own merits. As discussed above with respect to claim 79, Xing fails to teach or suggest a uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less teach or suggest that the first electrode comprises said uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film. As discussed above, with respect to claim 81, Xing fails to teach or suggest a first electrode comprising said uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less teach or suggest that the first electrode is a lower electrode.

Appellant respectfully submits that the rejection of claims 81 and 82 under 35 U.S.C. § 103(a) should be reversed.

3. The Obviousness Rejection of Claim 85 (Group III) Should be Reversed

Claim 85 stands rejected under 35 U.S.C. § 103(a) as anticipated by Xing. Claim 85 depends from claim 79 and is allowable for at least the reasons set forth above with respect to claims 79, 80, and 86-92. Moreover, claim 85 is allowable on its own merit. As discussed above with respect to claim 79, Xing fails to teach or suggest a

uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less that the platinum group metal film is oxidation resistant.

Appellant respectfully submits that the rejection of claim 85 under 35 U.S.C. § 103(a) should be reversed.

C. The Obviousness Rejection of Claims 88, 90, and 91 (Group I) Should be Reversed

Claims 88, 90, and 91 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Xing and further in view of Summerfelt. Summerfelt relates to a thin unreactive film (platinum) contacting a high-dielectric-constant material to an electrode. Summerfelt, like Xing, uses conventional sputter deposition methods to form the platinum layer. See Col. 8, lines 26-29. Summerfelt, therefore, fails to teach or suggest a capacitor having at least one electrode "at a sidewall region" being "a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film." Therefore, neither Xing nor Summerfelt considered alone or in combination, teach or suggest all claim limitations of amended independent claim 79. Accordingly, Appellant respectfully submits that the rejection of claims 88, 90, and 91 under 35 U.S.C § 103(a) should be reversed.

IX. CLAIMS INVOLVED IN THE APPEAL

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above, the claims in Appendix A include the amendments filed by Applicant on April 23, 2003.

Dated: February 18, 2004

Respectfully submitted,

By _____

Mark J. Thronson
Registration No.: 33,082
DICKSTEIN SHAPIRO MORIN &
OSHINSKY LLP
2101 L Street NW
Washington, DC 20037-1526
(202) 785-9700
Attorney for Appellant

APPENDIX A

79. A capacitor comprising:

a substrate having a trench;

a barrier layer disposed over a surface of said trench;

a first electrode in contact with said barrier layer at a sidewall region;

a dielectric layer in contact with said first electrode and said barrier layer; and

a second electrode in contact with said dielectric layer at a sidewall region, wherein at least one of said first and second electrodes comprises a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film.

80. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises PT.

81. The capacitor according to claim 79, wherein said first electrode comprises said uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film.

82. The capacitor according to claim 81, wherein said first electrode is a lower electrode.

85. The capacitor of claim 79, wherein said uniform, essentially carbon-free

oxygen annealed photo-decomposed platinum group metal film is oxidation resistant.

86. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Rh.

87. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Pd.

88. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Os.

89. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Ir.

90. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Au.

91. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Ag.

92. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Ru.

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(PATENT)

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Commissioner for Patents
P.O. Box 1450
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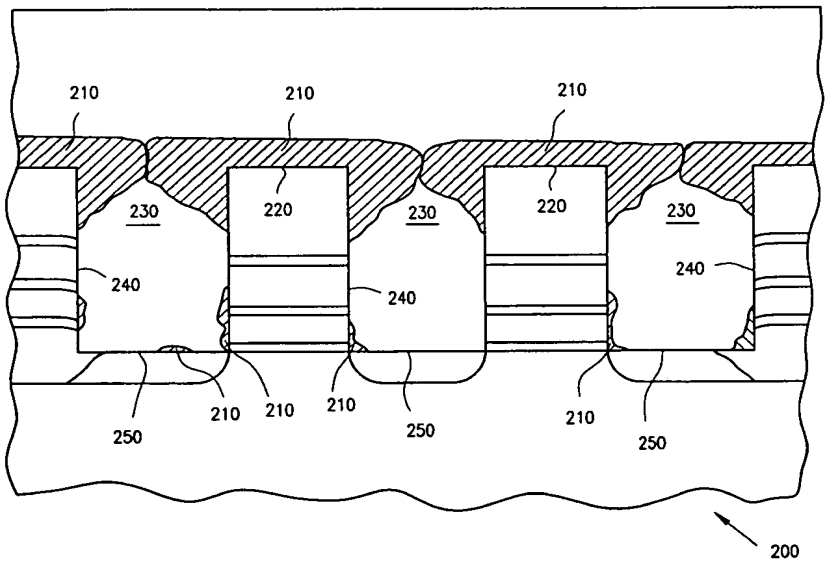
electrode deposition techniques result in platinum group metal films that are unable to achieve good step coverage, i.e., continuous films on sidewalls of three-dimensional structures. The known methods also fail to result in a platinum group metal film having a uniform thickness on sidewalls of three-dimensional structures, e.g., a trench capacitor. As explained in the present specification (page 1, lines 17-23 and page 2, line 8 through page 3, line 12), these techniques fail to achieve a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film.

The failure to achieve a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film is due to the fact that when conventional platinum group metal precursors are used in the conventional chemical vapor deposition methods, it is difficult to control the nucleation rate of the platinum group metal precursors. (Page 1, lines 24-25). At the outset of the platinum group metal precursor deposition process, the nucleation rate of the platinum group metal precursor onto the surface of the substrate is very slow; however, once nucleation begins, the deposition rate of the precursor increases significantly. (Page 1, line 25 through page 2, line 2). In fact, it is difficult to control or even slow the rate of deposition once the conventional methods begin depositing platinum group metal precursors onto the surface of the substrate. (Page 2 lines 2-5). In the conventional methods therefore, it is difficult to begin the deposition process and even more difficult to thereafter control the deposition rate so as to arrive at a uniformly thin film on the sidewalls of a three-dimensional structure, e.g., a trench capacitor. (Page 2, lines 5-7).

One example of the problem with using conventional methods to deposit platinum is discussed with reference to FIG. 1. Here it is desired to deposit a platinum layer 210 onto the side surfaces of a deep container capacitor precursor 230. The platinum layer 210 is formed by CVD deposition using a conventional platinum precursor. As the process of deposition begins, a platinum layer 210 forms on the

upper layer 220 of the capacitor precursor 230. Since it is difficult to control the deposition rate, the platinum layer 210 quickly forms a thick layer on the upper layer 220 of the capacitor precursor 230 before it can coat the inside walls of the capacitor precursor 230. That is, the quickly formed platinum layer 210 pinches together over the opening in the capacitor precursor 230 and very little platinum is able to form on the inside walls 240 or the bottom 250. Thus, an inconsistent platinum layer is formed on the inside walls 240 and the bottom 250 of the capacitor precursor 230 resulting in poor step coverage. (Page 2, lines, 8-20).

FIG. 1
(PRIOR ART)

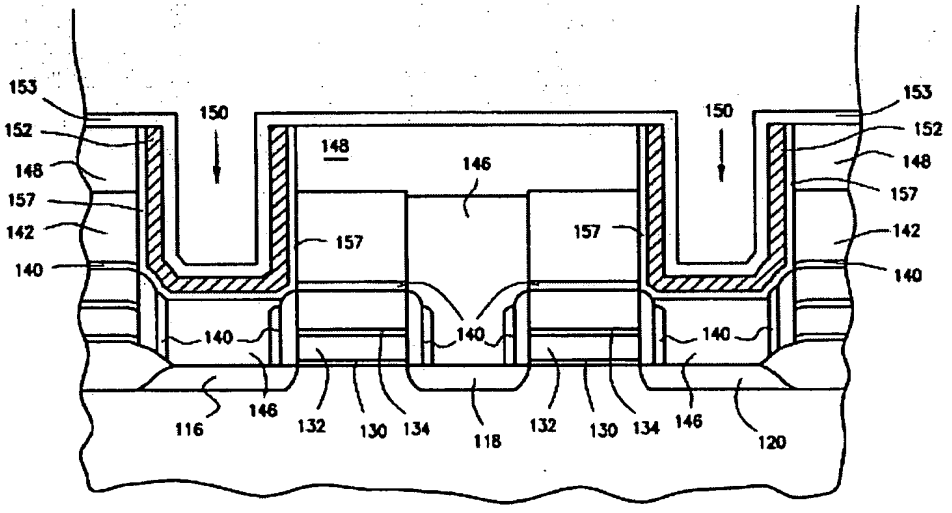


As discussed in the specification (page 2, line 26 through page 3, line 1), it has been suggested that the temperature at which the platinum group metal precursors were deposited should be decreased. Once the temperature of the CVD process is decreased, the growth rate of the platinum also decreases, resulting in better step coverage; however, an unintended consequence of decreasing the temperature is a high carbon content measured in the deposited film, resulting in poor platinum group metal film quality. (Page 3, lines 1-3).

To reduce the carbon content of the film, oxygen could be added during the CVD process. (Page 3, lines 4-5). Although the addition of oxygen removes some of the carbon from the platinum film, the oxygen also increases the deposition rate resulting in a film similar to the deposited film described above with respect to FIG. 1. (Page 3, lines 5-8). Thus, without the present invention it is difficult to achieve a uniform platinum group metal film, that is essentially carbon free, on the sidewalls of three-dimensional structures, e.g., a trench capacitor.

The present invention overcomes the drawbacks of the prior art by providing an improved platinum group metal film for a capacitor electrode (Page 3, lines 15-18). The metal film is uniform, essentially carbon-free, oxygen annealed, and photo-decomposed. The film is formed by first depositing a platinum metal group precursor in conjunction with ultraviolet light, followed by low temperature annealing in an oxygen atmosphere to remove carbon. An exemplary embodiment of the resulting structure is illustrated below in FIG. 11. As discussed in the specification (page 15, lines 20-23), a second platinum group metal film may be provided over the first platinum group metal film 152.

FIG. 11



VI. ISSUES

A. Whether the rejection of claims 79-82 and 85-92 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,090,697 (hereinafter "Xing") should be reversed?

B. Whether the rejection of claims 79-82 and 85-87, 89, and 92 under 35 U.S.C. § 103(a) as being unpatentable over Xing should be reversed?

C. Whether the rejection of claims 88, 90, and 91 under 35 U.S.C. § 103(a) as being unpatentable over Xing in view of U.S. Patent No. 5,566,045 (hereinafter "Summerfelt") should be reversed?

VII. GROUPING OF CLAIMS

For purposes of this appeal brief only, and without conceding the teachings of any prior art reference, the claims have been grouped as indicated below:

Group	Claims
I.	Claims 79, 80, and 86-92
II.	Claims 81 and 82
III	Claim 85

Claims of Group I do not stand or fall together with claims of Groups II and III. Claims of Group II do not stand or fall together with claims of Groups I and III. Group III includes only one claim, and does not stand or fall together with claims of Groups I and II. In Section VIII below, Applicant has included arguments supporting the separate patentability of each claim Group, as required by M.P.E.P. § 1206.

VIII. ARGUMENTS

A. The Anticipation Rejection of Claims 79-82 and 85-92 Should be Reversed

1. The Anticipation Rejection of Claims 79, 80, and 86-92 (Group I) Should be Reversed

Claims 79, 80, and 86-92 stand rejected under 35 U.S.C. § 102(e) as anticipated by Xing. Claim 79 recites a "capacitor comprising: a substrate having a trench; a barrier layer disposed over a surface of said trench; a first electrode in contact with said barrier layer at a sidewall region; a dielectric layer in contact with said first electrode and said barrier layer; and a second electrode in contact with said dielectric layer at a sidewall region." Claim 79 further recites that "at least one of said first and second electrodes comprises a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film."

Xing relates to a high-selectivity via etching process. Specifically, Xing teaches a process in which an etchstop layer is formed; a dielectric layer is formed over the etchstop layer, and the dielectric layer is etched with a fluorine-bearing etchant. Xing fails to teach or suggest a capacitor having at least one electrode "at a sidewall region" being "a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film." Indeed, Xing discloses a step of forming a platinum layer by conventional sputter deposition. (Col. 10, lines 30-34). Because Xing forms its platinum layer by conventional sputter deposition, the layer will not have a uniform thickness on the sidewalls of the trench capacitor illustrated (FIG. 3). Even if the platinum layer were somehow uniform, it would not be "essentially carbon-free" at the sidewall region.

The Examiner contends that FIG. 3 of Xing teaches all of the claim limitations of independent claim 79. The Examiner admits, however, that Xing makes no mention

as to the carbon content of the final device. The Examiner also argues that because carbon is detrimental to the device, it is considered inherent that the Xing electrode is essentially free of carbon. This is an untenable position. It is not supported by the evidence. As admitted by the Examiner, Xing fails to disclose the importance of maintaining an essentially carbon-free platinum layer.

As discussed above with respect to the summary of the invention, conventional platinum layers have a relatively high carbon content. The claimed invention improves on the product disclosed by Xing. As such, claim 79 recites a platinum group metal film "essentially carbon-free" at a sidewall region.

Further, the Examiner argues that the limitation "oxygen annealed photo-decomposed platinum group metal film" is drawn to the process by which the capacitor is made, and can be ignored. Please note, however, that the claims recite a capacitor structure having distinct and defined characteristics. The term "uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film" describes the physical characteristics of at least one of first and second electrodes in claim 79.

Claim limitations which confer distinct and defined characteristics of a structure were analyzed by the Federal Circuit in Hazani v. U.S. Int'l Trade Comm'n, for example, which involved patent claims to a memory cell comprising a conductive plate having a surface that was "chemically engraved." Hazani v. U.S. Int'l Trade Comm'n, 126 F.3d 1473, 44 USPQ2d 1358 (Fed. Cir. 1997). In Hazani, the Federal Circuit emphasized that the claims were "pure product claims" and not product-by-process claims. The plaintiff had argued that the "chemically engraved" claims were product-by-process claims. The Federal Circuit determined, however, that the claims were "best characterized as pure product claims, since the 'chemically engraved'

limitation, read in context, describes the product more by its structure than by the process used to obtain it." Id.

Here too, the limitation "uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film" of claim 79 is a structural limitation and not a product-by-process limitation. A "uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film," like the "chemically engraved" plate of Hazani, is a *resulting structure* having distinct and defined characteristics and not a product formed by a particular process.

Even if we were to assume that the claim limitations of claim 79 could somehow be considered product-by-process limitations, "[t]he structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product." MPEP § 2113 (citing In re Garnero, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979)).

For example, the uniform, essentially carbon free oxygen annealed photo-decomposed platinum group is deposited onto the barrier layer without oxidizing the underlying barrier layer during the annealing step. Additionally, due to the manner in which the platinum group metal is deposited, the platinum group metal film is deposited as a platinum group metal film having a uniform thickness of about 20 to about 2000 Angstroms. In the present case, the process by which the platinum group metal film is deposited results in a platinum group metal film that is essentially carbon-free.

For at least the foregoing reasons, claim 79 is allowable over Xing. Claims 80 and 86-92 depend from claim 79, and are allowable along with claim 79. Accordingly, Appellant respectfully submits that the rejection of claims 79, 80, and 86-92 under 35 U.S.C. § 102(e) should be reversed.

2. The Anticipation Rejection of Claims 81 and 82 (Group II) Should be Reversed

Claims 81 and 82 stand rejected under 35 U.S.C. § 102(e) as anticipated by Xing. Claims 81 and 82 depend from claim 79 and should be allowable for at least the reasons set forth above with respect to claims 79, 80, and 86-92. Moreover, claims 81 and 82 should be allowable on their own merits. Claim 81 recites "the capacitor according to claim 79, wherein said first electrode comprises said uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film." As discussed above with respect to claim 79, Xing fails to teach or suggest a uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less teach or suggest that the first electrode has the uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film.

Claim 82 recites "the capacitor according to claim 81, wherein said first electrode is a lower electrode." As discussed above, with respect to claim 81, Xing fails to teach or suggest a first electrode comprising said uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less teach or suggest that the first electrode is a lower electrode.

Appellant respectfully submits that the rejection of claims 81 and 82 under 35 U.S.C. § 102(e) should be reversed.

3. The Anticipation Rejection of Claim 85 (Group III) Should be Reversed

Claim 85 stands rejected under 35 U.S.C. § 102(e) as anticipated by Xing. Claim 85 depends from claim 79 and should be allowable for at least the reasons set forth above with respect to claims 79, 80, and 86-92. Moreover, claim 85 should be allowable on its own merit. Claim 85 says that "said . . . platinum group metal film is oxidation resistant." As discussed above with respect to claim 79, Xing fails to teach or suggest a uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less that the platinum group metal film is oxidation resistant. Appellant respectfully submits that the rejection of claim 85 under 35 U.S.C. § 102(e) should be reversed.

B. The Obviousness Rejection of Claims 79-82, 85-87, 89, and 92 Should be Reversed

1. The Obviousness Rejection of Claims 79, 80, 86, 87, 89, and 92 (Group I) Should be Reversed

Claims 79, 80, 86-87, 89, and 92 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Xing. Having admitted that Xing does not even mention the problem of carbon content, the Examiner contends, in the alternative, that the deposition of a platinum layer in an oxygen environment is known in the art, and that this technique would reduce the carbon content of platinum layers. The Examiner fails to recognize, however, that the process of sputter deposition, as taught by Xing, in the presence of oxygen would result in the disadvantage of having "pinch-off" effect described above with respect to FIG. 1. That is, the process disclosed by Xing would not result in a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film.

Additionally, please note that the addition of oxygen in a sputtering process would result in a platinum group metal film having a high carbon content, i.e., not a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film. Therefore, Xing fails to teach or suggest the capacitor of claim 79, which has an electrode comprising "a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film."

As the Federal Circuit has stated: "In order to render a claimed apparatus or method obvious, the prior art must enable one skilled in the art to make and use the apparatus or method." Beckman Instruments, Inc. v. LKB Produkter AB, 892 F.2d 1547, 1551, 13 USPQ2d 1301, 1304 (Fed. Cir. 1989) (citing In re Payne, 606 F.2d 303, 314, 203 USPQ 245, 255 (CCPA 1979) ("References relied upon to support a rejection under 35 USC 103 must provide an enabling disclosure, i.e., they must place the claimed invention in the possession of the public. An invention is not 'possessed' absent some known or obvious way to make it.") (quoting In re Hoeksema, 399 F.2d 209, 274 (CCPA 1968)). The Federal Circuit reiterated this proposition in Motorola, Inc. v. Interdigital Technology Corp., 121 F.3d 1461, 1472, 43 USPQ2d 1481, 1489 (Fed. Cir. 1997) (quoting Beckman, supra).

Where the reference does not include an enabling disclosure, "secondary evidence, such as other patents or publications, can be cited to show public possession of the method of making and/or using [the claimed article]." M.P.E.P. § 2121.01(I). Here, there is no such enabling disclosure as the Final Rejection fails to cite any secondary evidence that a method of making and/or using the claimed capacitor with its electrode comprising a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film" was in the public possession at the time of the present invention.

For at least the foregoing reasons, claim 79 is allowable over Xing. Claims 80, 86, 87, 89, and 92 depend from claim 79, and are allowable along with claim 79. Accordingly, Appellant respectfully submits that the rejection of claims 79, 80, 86, 87, 89, and 92 under 35 U.S.C. § 103(a) should be reversed.

2. The Obviousness Rejection of Claims 81 and 82 (Group II) Should be Reversed

Claims 81 and 82 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Xing. Claims 81 and 82 depend from claim 79 and is allowable for at least the reasons set forth above with respect to claims 79, 80, and 86-92. Moreover, claims 81 and 82 are allowable on their own merits. As discussed above with respect to claim 79, Xing fails to teach or suggest a uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less teach or suggest that the first electrode comprises said uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film. As discussed above, with respect to claim 81, Xing fails to teach or suggest a first electrode comprising said uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less teach or suggest that the first electrode is a lower electrode.

Appellant respectfully submits that the rejection of claims 81 and 82 under 35 U.S.C. § 103(a) should be reversed.

3. The Obviousness Rejection of Claim 85 (Group III) Should be Reversed

Claim 85 stands rejected under 35 U.S.C. § 103(a) as anticipated by Xing. Claim 85 depends from claim 79 and is allowable for at least the reasons set forth above with respect to claims 79, 80, and 86-92. Moreover, claim 85 is allowable on its own merit. As discussed above with respect to claim 79, Xing fails to teach or suggest a

uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film, much less that the platinum group metal film is oxidation resistant.

Appellant respectfully submits that the rejection of claim 85 under 35 U.S.C. § 103(a) should be reversed.

C. The Obviousness Rejection of Claims 88, 90, and 91 (Group I) Should be Reversed

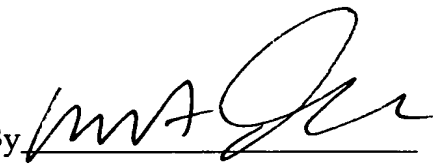
Claims 88, 90, and 91 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Xing and further in view of Summerfelt. Summerfelt relates to a thin unreactive film (platinum) contacting a high-dielectric-constant material to an electrode. Summerfelt, like Xing, uses conventional sputter deposition methods to form the platinum layer. See Col. 8, lines 26-29. Summerfelt, therefore, fails to teach or suggest a capacitor having at least one electrode "at a sidewall region" being "a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film." Therefore, neither Xing nor Summerfelt considered alone or in combination, teach or suggest all claim limitations of amended independent claim 79. Accordingly, Appellant respectfully submits that the rejection of claims 88, 90, and 91 under 35 U.S.C § 103(a) should be reversed.

IX. CLAIMS INVOLVED IN THE APPEAL

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above, the claims in Appendix A include the amendments filed by Applicant on April 23, 2003.

Dated: February 18, 2004

Respectfully submitted,



By

Mark J. Thronson
Registration No.: 33,082
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP
2101 L Street NW
Washington, DC 20037-1526
(202) 785-9700
Attorney for Appellant

APPENDIX A

79. A capacitor comprising:

a substrate having a trench;

a barrier layer disposed over a surface of said trench;

a first electrode in contact with said barrier layer at a sidewall region;

a dielectric layer in contact with said first electrode and said barrier layer; and

a second electrode in contact with said dielectric layer at a sidewall region, wherein at least one of said first and second electrodes comprises a uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film.

80. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises PT.

81. The capacitor according to claim 79, wherein said first electrode comprises said uniform, essentially carbon-free oxygen-annealed photo-decomposed platinum group metal film.

82. The capacitor according to claim 81, wherein said first electrode is a lower electrode.

85. The capacitor of claim 79, wherein said uniform, essentially carbon-free

oxygen annealed photo-decomposed platinum group metal film is oxidation resistant.

86. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Rh.

87. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Pd.

88. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Os.

89. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Ir.

90. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Au.

91. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Ag.

92. The capacitor according to claim 79, wherein said uniform, essentially carbon-free oxygen annealed photo-decomposed platinum group metal film comprises Ru.